

**A Research Bulletin**

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## Soil Nail Launcher Saves Time and Money on Slide Repairs

### Business Issue

Missouri's rolling hills and streams have attracted the attention of visitors since the state's first settlers. Unfortunately, the beauty also has a beast ... soil erosion. Slope repairs along Missouri's highways are labor intensive, costly, and often must be repeated. They also can be damaging to highway shoulders, pavements and can require lane closures for several days. A faster, more effective repair method has been needed.

### Background

Soil nailing is a proven method of stabilizing slopes. However, traditional soil nailing is a slow process requiring extensive excavation and drilling to insert the steel rods. Slide repairs using traditional soil nailing often take weeks to complete. The Soil Nail Launcher, provided by Soil Nail Launcher, Inc., can complete slide repairs in just a few days and provide added strength. Adapted from British military technology, the launcher uses compressed air to send 1.5-inch steel bars 20 feet or more into the soil. The bars traveling up to 220 miles per hour create a shock wave causing the soil to jump away and allowing the bar to pass. The soil then collapses around the bar creating a powerful bond. Tests have shown this bond to be much greater than percussion-driven nails. The bars can be solid, threaded or hollow with plain, galvanized or epoxy coatings. Hollow bars can serve as horizontal drains. Depending upon soil characteristics and its penetration resistance, the Soil Nail Launcher application is appropriate for shallow to medium depth slide repairs.

### Approach

While the Soil Nail Launcher had proven effective in demonstration projects in Colorado, Washington and Oregon, no Missouri application had been conducted. Organizational Results partnered with Soils and Geology and District 3 staff to test the Soil Nail Launcher on an emergency slide repair project on Route 24 in Monroe County. Work took place using the launcher on June 26, 2006, and was completed within minimal time.

Following completion of the soil nailing on the Route 24 slide, instrumentation was installed by MoDOT along the slope to monitor its post-performance. Instrumentation included piezometers for determining groundwater level within the slope and inclinometers for monitoring depth and extent of any further lateral movement within the slope.



**Figure 1 - Soil Nail Launcher on Route 24, Monroe County**

Survey control points were also placed along the slope to measure any horizontal and vertical movement of the slope surface. Monitoring of the slope by District 3 personnel will take place over the next two years.



Figure 2 - Steel rods being trimmed following installation

## Conclusions and Recommendations

■ **The Soil Nail Launcher saved time.** District staff worked with the contractor to complete 300 feet of slope in only two working days. It's estimated that the project would have required five to six weeks to complete with traditional repair methods. The project also saved about four to five weeks' maintenance labor.

■ **The Soil Nail Launcher saved money.** The cost for the project was just under \$125,000, which included nail installation (300 feet of slope with two to three rows of rods every three feet) and mobilization costs. A manual fix would have cost about \$400,000 to \$500,000. The manual fix would have required a rock wedge repair at the top and a toe buttress along the foot of the slope.

■ **The Soil Nail Launcher resulted in minimal traffic disruptions.** The launcher required only one lane of traffic to be closed at a time. It's also possible to set the work site to avoid any lane closures.

■ **The Soil Nail Launcher may be a good approach in certain circumstances.** The launcher may be a good choice when there is limited working room or where closing the road is not an option. The launcher is also less intrusive than traditional methods, which can damage surrounding soil and vegetation.

## For More Information

Mike Fritz, P.E.  
Missouri Department of Transportation  
(573) 526-4346  
[mike.fritz@modot.mo.gov](mailto:mike.fritz@modot.mo.gov)

Dennis Lambert, R.G.  
Missouri Department of Transportation  
(573) 248-2474  
[dennis.lambert@modot.mo.gov](mailto:dennis.lambert@modot.mo.gov)

Soil Nail Launcher, Inc.  
<http://www.soilnaillauncher.com>



Missouri Department of Transportation  
Organizational Results  
P.O. Box 270  
Jefferson City, MO 65102

573.751.3002  
1 888 ASK MODOT  
[rdtcomments@modot.mo.gov](mailto:rdtcomments@modot.mo.gov)  
[www.modot.org/services/rdt](http://www.modot.org/services/rdt)